

Institute of Environmental Sciences

Topic: Rescue behavior among Formicidae: contributing factors and mechanisms

Name of supervisor: dr hab. Marcin Czarnołęski, prof UJ

marcin.czarnoleski@uj.edu.pl

Background information (max 200 words):

Cooperative behavior is common in the animal kingdom, but biologists are still looking for factors responsible for it among animals. Undoubtedly, in species with an extensive social system, kinship is of great significance. It is also the key to the development of eusociality, which is the highest level of social organization in the animal kingdom. The predominance of eusocial societies over sedentary or even group-living animals lies probably in the highly cooperative (sometimes even termed “altruistic”) behavior of the former. Ants provide an example of animals forming eusocial societies. They often demonstrate also striking “altruistic” tendencies, such as rescue behavior. Simplest forms of rescue behavior in ants were mentioned anecdotally for the first time in 1874 and then noted several times by different authors until more advanced forms of rescue behavior were observed by Czechowski and others (2002) and by Nowbahari with co-authors (2009). In all cases, the behavior of rescuers was aimed at providing help to the imperiled, related nestmate. However, there is a considerable and largely unexplained variation in rescue proneness among ants (Hollis and Nowbahari 2013, Miler et al. 2017). Furthermore, the mechanism(s) responsible for the expression of rescue behavior in ants remain a mystery.

The main question to be addressed in the project:

The aim is to assess the importance of various factors such as life expectancy or stress for the expression of rescue behavior both within as well as among different species of ants. Also, uncovering possible mechanism(s) of rescue expression, such as stridulatory behavior or pheromonal “call for help”, will be an important aspect of the project. In this, important gaps in our knowledge regarding cooperation among animals will be filled.

Information on the methods/description of work:

Work in the project constitutes of both field as well as laboratory tasks. These include mainly extensive field surveys aimed at finding nests of different ant species and conducting behavioral tests later analyzed using appropriate software. In addition, microacoustic as well as biochemical analyzes are likely to be performed in the project. Creating databases, performing statistical analyzes and writing manuscripts will be a must.

Additional information (e.g . Special requirements from the student):

Experience in conducting behavioral studies is welcome and interest in entomology, especially in social insect biology, is desirable. Good communication skills (oral and written) in English are required.

Place/name of potential foreign collaborator:

Direct foreign collaboration is not planned at this stage, but I is possible.

References:

- Czechowski W, Godzińska EJ, Kozłowski MW. 2002. Rescue behavior shown by workers of *Formica sanguinea* Latr., *F. fusca* L. and *F. cinerea* Mayr (Hymenoptera: Formicidae) in response to their nestmates caught by an ant lion larva. *Annales Zoologici* 52:423–431.
- Hollis KL, Nowbahari E. 2013. A comparative analysis of precision rescue behaviour in sand-dwelling ants. *Animal Behaviour* 85:537-544.
- Miler K, Yahya BE, Czarnoleski M. 2017b. Pro-social behaviour of ants depends on their ecological niche: rescue actions in species from tropical and temperate regions. *Behavioural Processes* 144:1-4.
- Nowbahari E, Scohier A, Durand J, Hollis KL. 2009. Ants, *Cataglyphis cursor*, Use Precisely Directed Rescue Behavior to Free Entrapped Relatives. *PLOS ONE* 4:e6573.